

PKM8720DF-C13-F10 Module

DATASHEET

Rev. 1.0

Mar. 30, 2023

COPYRIGHT

©2022 PanKore Integrated Circuit Technology co. Ltd. All rights reserved. No part of this document may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language in any form or by any means without the written permission of PanKore Integrated Circuit Technology co. Ltd.

DISCLAIMER

Please Read Carefully:

PanKore Integrated Circuit Technology co. Ltd, (PanKore) reserves the right to make corrections, enhancements, improvements and other changes to its products and services. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

Reproduction of significant portions in PanKore data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. PanKore is not responsible or liable for such reproduced documentation. Information of third parties may be subject to additional restrictions.

Buyers and others who are developing systems that incorporate PanKore products (collectively, "Customers") understand and agree that Customers remain responsible for using their independent analysis, evaluation and judgment in designing their applications and that Customers have full and exclusive responsibility to assure the safety of Customers' applications and compliance of their applications (and of all PanKore products used in or for Customers' applications) with all applicable regulations, laws and other applicable requirements. Designer represents that, with respect to their applications, Customer has all the necessary expertise to create and implement safeguards that (1) anticipate dangerous consequences of failures, (2) monitor failures and their consequences, and (3) lessen the likelihood of failures that might cause harm and take appropriate actions. Customer agrees that prior to using or distributing any applications that include PanKore products, Customer will thoroughly test such applications and the functionality of such PanKore products as used in such applications.

PanKore's provision of technical, application or other design advice, quality characterization, reliability data or other services or information, including, but not limited to, reference designs and materials relating to evaluation kits, (collectively, "Resources") are intended to assist designers who are developing applications that incorporate PanKore products; by downloading, accessing or using PanKore's Resources in any way, Customer (individually or, if Customer is acting on behalf of a company, Customer's company) agrees to use any particular PanKore Resources solely for this purpose and subject to the terms of this Notice.

PanKore's provision of PanKore Resources does not expand or otherwise alter PanKore's applicable published warranties or warranty disclaimers for PanKore's products, and no additional obligations or liabilities arise from PanKore providing such PanKore Resources. PanKore reserves the right to make corrections, enhancements, improvements and other changes to its PanKore Resources. PanKore has not conducted any testing other than that specifically described in the published documentation for a particular PanKore Resource.

Customer is authorized to use, copy and modify any individual PanKore Resource only in connection with the development of applications that include the PanKore product(s) identified in such PanKore Resource. No other license, express or implied, by estoppel or otherwise to any other PanKore intellectual property right, and no license to any technology or intellectual property right of PanKore or any third party is granted herein, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which PanKore products or services are used. Information regarding or referencing third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of PanKore Resources may require a license from a third party under the patents or other intellectual property of the third party, or a license from PanKore under the patents or other PanKore's intellectual property.

PanKore's Resources are provided "as is" and with all faults. PanKore disclaims all other warranties or representations, express or implied, regarding resources or use thereof, including but not limited to accuracy or completeness, title, any epidemic failure warranty and any implied warranties of merchantability, fitness for a particular purpose, and non-infringement of any third party intellectual property rights.

PanKore shall not be liable for and shall not defend or indemnify Customer against any claim, including but not limited to any infringement claim that related to or is based on any combination of products even if described in PanKore Resources or otherwise. In no event shall PanKore be liable for any actual, direct, special, collateral, indirect, punitive, incidental, consequential or exemplary damages in connection with or arising out of PanKore's Resources or use thereof, and regardless of whether PanKore has been advised of the possibility of such damages. PanKore is not responsible for any failure to meet such industry standard requirements.

Where PanKore specifically promotes products as facilitating functional safety or as compliant with industry functional safety standards, such products are intended to help enable customers to design and create their own applications that meet applicable functional safety standards and requirements. Using products in an application does not by itself establish any safety features in the application. Customers must ensure compliance with safety-related requirements and standards applicable to their applications. Designer may not use any PanKore products in life-critical medical equipment unless authorized officers of the parties have executed a special contract specifically governing such use. Life-critical medical equipment is medical equipment where failure of such equipment would cause serious bodily injury or death. Such equipment includes, without limitation, all medical devices identified by the U.S.FDA as Class III devices and equivalent classifications outside the U.S.

Customers agree that it has the necessary expertise to select the product with the appropriate qualification designation for their applications and that proper product selection is at Customers' own risk. Customers are solely responsible for compliance with all legal and regulatory requirements in connection with such selection.

Customer will fully indemnify PanKore and its representatives against any damages, costs, losses, and/or liabilities arising out of Designer's non-compliance with the terms and provisions of this Notice.

TRADEMARKS

PanKore is a trademark of PanKore Integrated Circuit Technology co. Ltd. Other names mentioned in this document are trademarks/registered trademarks of their respective owners.

USING THIS DOCUMENT

This document is intended for the software engineer's reference and provides detailed programming information.

Though every effort has been made to ensure that this document is current and accurate, more information may have become available subsequent to the production of this guide.

Contact Us

- Official website: <https://www.realmcu.com>
- Development documents: <https://www.realmcu.com/en/Home/DownloadList>
- Official forum: <https://www.realmcu.com/community/cimd>
- Sample purchase: <https://shop467975900.taobao.com>
- Business cooperation: sales@pankore.com
- Technical support: support@pankore.com

Contents

Contact Us	4
Contents.....	5
1 Module Overview	6
1.1 General Description	6
1.2 Features	6
2 Module Block Diagram	7
3 Module Pin Definition	8
3.1 Module Pin Layout	8
3.2 Module Pin Description	8
3.2.1 Pin Description	8
3.2.2 Strapping Pins	9
4 RF Characteristic	10
4.1 Wi-Fi Radio Standard	10
4.1.1 Wi-Fi 2.4GHz Band RF Transmitter Specification	10
4.1.2 Wi-Fi 2.4GHz Band RF Receiver Specification	10
4.1.3 Wi-Fi 5GHz Band RF Transmitter Specification	11
4.1.4 Wi-Fi 5GHz Band RF Receiver Specification	11
4.2 Bluetooth LE Radio Standard	12
4.2.1 Bluetooth LE RF Transmitter Specification	12
4.2.2 Bluetooth LE RF Receiver Specification	12
5 Module Electrical Characteristics	13
5.1 Module Operating Conditions	13
5.2 Module DC Characteristics	13
6 Module Schematics	14
6.1 Module Internal Schematics	14
6.2 Module Reference Schematics	14
7 Physical Dimensions	15
8 Product Handling	16
8.1 Storage Conditions	16
8.2 Production Instructions	16
8.3 Recommended Oven Temperature Curve	17
9 Revision History	18

1 Module Overview

1.1 General Description

The PKM8720DF-C13-F10 is a multi-radio MCU module. With the open CPU architecture, customers can develop advanced applications running on the dual-core 32-bit MCU. The radio provides support for Wi-Fi 802.11 a/b/g/n in the 2.4GHz/5GHz band and BLE 5.0 communications. The rich set of peripherals and high performance make it an ideal choice for smart homes, industrial automation, consumer electronics, etc.

1.2 Features

Chipset and Memory:

- RTL8720DF-VT1-CG (named RTL8720DF thereafter) chipset embedded, dual-core processor: KM4 up to 200MHz, KM0 up to 20MHz
- KM4 on-chip memory: up to 512KB SRAM
- KM0 on-chip memory: up to 64KB SRAM
- 4MB Flash

Wi-Fi:

- 802.11 a/b/g/n 1x1, 2.4GHz & 5GHz
- Center frequency range of operating channel: 2412MHz ~ 2484MHz, 5180MHz ~ 5825MHz
- Support 20MHz/40MHz bandwidth, up to the data rate of MCS7
- Wi-Fi WEP, WPA, WPA2, WPA3, WPS; open, shared key, and pair-wise key authentication services
- Support low power Tx/Rx for short-range application
- Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)

Bluetooth Low Energy:

- Bluetooth LE: Bluetooth 5.0
- Speed: 125Kbps, 500Kbps, 1Mbps, and 2Mbps
- Support LE secure connections
- Support LE scatternet
- Support 3 Master links/1 Slave link
- Co-existence RF design between Wi-Fi and Bluetooth

Peripherals:

- 4x UART interface, baud rate up to 6MHz
- 2 x I2C, two speed modes: standard up to 10Kbps, fast up to 400Kbps
- 2 x SDIO Host/SDIO 2.0 Device, clock up to 50MHz
- 3 x SPI Master/Slave, baud rate up to 50MHz
- 1 x USB 2.0 HS/FS/LS mode
- 11 x PWM with configurable duration and duty cycle from 0 ~ 100%
- 19 x programmable GPIOs
- KM4 and KM0 both have a GDMA controller, each with 6 channels

Antenna Option:

- On-board PCB antenna

Operating Conditions:

- Operating input voltage: $(3.3 \pm 10\%)V$
- Operating ambient temperature: -40°C to 105°C

2 Module Block Diagram

This module includes the chipset, crystal component, R/L/C components for RF matching, decoupling and RF radio antenna.

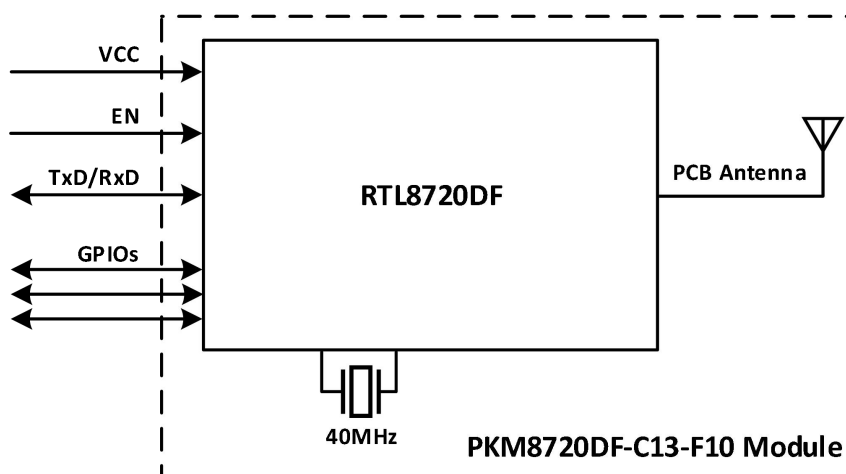


Figure 1. Block Diagram

3 Module Pin Definition

3.1 Module Pin Layout

This module has 22 pins.

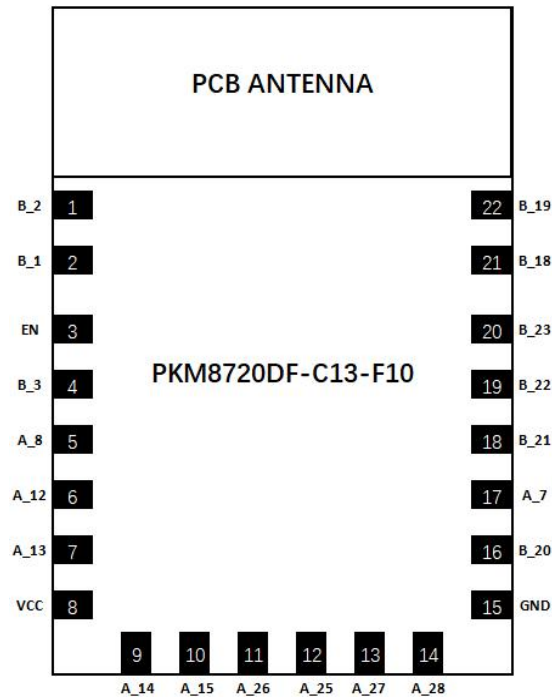


Figure 2. Module Pin Layout (Top View)

3.2 Module Pin Description

3.2.1 Pin Description

Table 1. Pin Description

Pin Name	Pin No.	Type	Description
B_2	1	I/O	GPIOB_2/UART_RXD
B_1	2	I/O	GPIOB_1/UART_TXD
EN	3	I	<ul style="list-style-type: none"> ● High: Enable the chip. ● Low: Module power off.
B_3	4	I/O	GPIOB_3/SWD_CLK
A_8	5	I/O	GPIOA_8/UART_LOG_RXD
A_12	6	I/O	GPIOA_12/SPI_MOSI
A_13	7	I/O	GPIOA_13/SPI_MISO
VCC	8	P	Power Supply
A_14	9	I/O	GPIOA_14/SPI_CLK/UART_RTS
A_15	10	I/O	GPIOA_15/SPI_CS/UART_CTS
A_26	11	I/O	GPIOA_26/HSDP
A_25	12	I/O	GPIOA_25/HSDM
A_27	13	I/O	GPIOA_27/SWD_DAT
A_28	14	I/O	GPIOA_28/RREF
GND	15	P	Ground
B_20	16	I/O	GPIOB_20/SDIO_CMD
A_7	17	I/O	GPIOA_7/UART_LOG_TXD

B_21	18	I/O	GPIOB_21/SDIO_CLK
B_22	19	I/O	GPIOB_22/SDIO_D0
B_23	20	I/O	GPIOB_23/SDIO_D1
B_18	21	I/O	GPIOB_18/SDIO_D2
B_19	22	I/O	GPIOB_19/SDIO_D3

i NOTE

- *P: power supply*
- *I: input*
- *O: output*

3.2.2 Strapping Pins

This module has 2 strapping pins.

Table 2. Strapping Pin

Pin Name	Pin No.	Default State	Description
A_7	17	Pull up	1: Normal mode (default) 0: Flash download mode
A_27	13	Pull up	1: Normal mode (default) 0: Test mode

4 RF Characteristic

4.1 Wi-Fi Radio Standard

Table 3. Wi-Fi Radio Standard

Wi-Fi Wireless Standard	Description
Wi-Fi frequency range	<ul style="list-style-type: none"> 2412MHz ~ 2484MHz (2.4GHz ISM Band) 5180MHz ~ 5825MHz (5GHz)
Wi-Fi wireless standard	IEEE 802.11 a/b/g/n
Wi-Fi wireless standard Modulation	DSSS, DBPSK, DQPSK, CCK and OFDM (BPSK/QPSK/16-QAM/64-QAM)
Wi-Fi wireless data rate	<ul style="list-style-type: none"> 802.11a: 6/9/12/18/24/36/48/54 Mbps 802.11b: 1/2/5.5/11 Mbps 802.11g: 6/9/12/18/24/36/48/54 Mbps 802.11n: HT20 MCS0-7, HT40 MCS0-7

4.1.1 Wi-Fi 2.4GHz Band RF Transmitter Specification

Table 4. Wi-Fi 2.4GHz Transmitter Performance Specification

Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency Range	-	2412	-	2484	MHz
Tx power at the antenna port for the highest power level (25°C)	1 Mbps DSSS	-	20	-	dBm
	11 Mbps DSSS	-	18	-	dBm
	6 Mbps OFDM	-	19	-	dBm
	54 Mbps OFDM	-	17	-	dBm
	HT20 MCS0	-	18	-	dBm
	HT20 MCS7	-	16	-	dBm
	HT40 MCS0	-	18	-	dBm
	HT40 MCS7	-	16	-	dBm
Tx EVM	1 Mbps DSSS	-	8	-	%
	11 Mbps DSSS	-	8	-	%
	6 Mbps OFDM	-	-5	-	dB
	54 Mbps OFDM	-	-25	-	dB
	HT20 MCS0	-	-5	-	dB
	HT20 MCS7	-	-28	-	dB
	HT40 MCS0	-	-5	-	dB
	HT40 MCS7	-	-28	-	dB
Carrier Suppression		-	-	-30	dBc
Harmonic Output Power	2nd Harmonic	-	-	-45	dBm/MHz
	3rd Harmonic	-	-	-45	dBm/MHz

4.1.2 Wi-Fi 2.4GHz Band RF Receiver Specification

Table 5. Wi-Fi 2.4GHz Receiver Performance Specification

Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency Range	-	2412	-	2484	MHz
802.11b Rx Sensitivity (8% PER)	1 Mbps DSSS	-	-96	-	dBm
	2 Mbps DSSS	-	-94	-	dBm
	5.5 Mbps DSSS	-	-92	-	dBm
	11 Mbps DSSS	-	-89	-	dBm
802.11g Rx Sensitivity (10% PER)	6 Mbps OFDM	-	-93	-	dBm
	9 Mbps OFDM	-	-92	-	dBm
	12 Mbps OFDM	-	-91	-	dBm
	18 Mbps OFDM	-	-88	-	dBm

	24 Mbps OFDM	-	-85	-	dBm
	36 Mbps OFDM	-	-82	-	dBm
	48 Mbps OFDM	-	-77	-	dBm
	54 Mbps OFDM	-	-75	-	dBm
802.11n Rx Sensitivity (10% PER)	HT20 MCS0	-	-93	-	dBm
	HT20 MCS1	-	-90	-	dBm
	HT20 MCS2	-	-87	-	dBm
	HT20 MCS3	-	-84	-	dBm
	HT20 MCS4	-	-81	-	dBm
	HT20 MCS5	-	-76	-	dBm
	HT20 MCS6	-	-75	-	dBm
	HT20 MCS7	-	-73	-	dBm
	HT40 MCS0	-	-91	-	dBm
	HT40 MCS1	-	-87	-	dBm
	HT40 MCS2	-	-84	-	dBm
	HT40 MCS3	-	-81	-	dBm
	HT40 MCS4	-	-78	-	dBm
	HT40 MCS5	-	-73	-	dBm
	HT40 MCS6	-	-72	-	dBm
	HT40 MCS7	-	-70	-	dBm
Maximum Receive Level	1 Mbps DSSS	-	-	0	dBm
	11 Mbps DSSS	-	-	0	dBm
	6Mbps OFDM	-	-	0	dBm
	54Mbps OFDM	-	-	0	dBm
	MCS 0	-	-	0	dBm
	MCS 7	-	-	0	dBm

4.1.3 Wi-Fi 5GHz Band RF Transmitter Specification

Table 6. Wi-Fi 5GHz Transmitter Performance Specification

Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency Range	-	5180	-	5825	MHz
Tx power at the antenna port for the highest power level (25°C)	6 Mbps OFDM	-	17	-	dBm
	54 Mbps OFDM	-	13	-	dBm
	HT20 MCS0	-	15	-	dBm
	HT20 MCS7	-	12	-	dBm
	HT40 MCS0	-	15	-	dBm
	HT40 MCS7	-	12	-	dBm
Tx EVM	6 Mbps OFDM	-	-5	-	dB
	54 Mbps OFDM	-	-25	-	dB
	HT20 MCS0	-	-5	-	dB
	HT20 MCS7	-	-28	-	dB
	HT40 MCS0	-	-5	-	dB
	HT40 MCS7	-	-28	-	dB
Carrier Suppression	-	-	-	-30	dBc

4.1.4 Wi-Fi 5GHz Band RF Receiver Specification

Table 7. Wi-Fi 5GHz Receiver Performance Specification

Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency Range	-	5180	-	5825	MHz
802.11g Rx Sensitivity (10% PER)	6 Mbps OFDM	-	-91	-	dBm
	9 Mbps OFDM	-	-91	-	dBm
	12 Mbps OFDM	-	-90	-	dBm
	18 Mbps OFDM	-	-87	-	dBm
	24 Mbps OFDM	-	-84	-	dBm

	36 Mbps OFDM	-	-81	-	dBm
	48 Mbps OFDM	-	-76	-	dBm
	54 Mbps OFDM	-	-74	-	dBm
802.11n Rx Sensitivity (10% PER)	HT20 MCS0	-	-91	-	dBm
	HT20 MCS1	-	-89	-	dBm
	HT20 MCS2	-	-86	-	dBm
	HT20 MCS3	-	-83	-	dBm
	HT20 MCS4	-	-80	-	dBm
	HT20 MCS5	-	-75	-	dBm
	HT20 MCS6	-	-73	-	dBm
	HT20 MCS7	-	-72	-	dBm
	HT40 MCS0	-	-89	-	dBm
	HT40 MCS1	-	-86	-	dBm
	HT40 MCS2	-	-83	-	dBm
	HT40 MCS3	-	-80	-	dBm
	HT40 MCS4	-	-77	-	dBm
	HT40 MCS5	-	-72	-	dBm
	HT40 MCS6	-	-71	-	dBm
	HT40 MCS7	-	-69	-	dBm
Maximum Receive Level	6Mbps OFDM	-	-	0	dBm
	54Mbps OFDM	-	-	0	dBm
	MCS 0	-	-	0	dBm
	MCS 7	-	-	0	dBm

4.2 Bluetooth LE Radio Standard

4.2.1 Bluetooth LE RF Transmitter Specification

Table 8. Bluetooth LE Transmitter Performance Specification

Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency Range	-	2402	-	2480	MHz
Tx Output Power	LE1M	-10	4.5	10	dBm
	LE2M				
Modulation Characteristics (LE1M)	$\Delta F1$ Avg.	225	-	275	kHz
	$\Delta F2$ Max.	185	-	-	kHz
	Modulation Index ($\Delta F2$ Avg./ $\Delta F1$ Avg.)	0.8	-	-	
Modulation Characteristics (LE2M)	$\Delta F1$ Avg.	450	-	550	kHz
	$\Delta F2$ Max.	370	-	-	kHz
	Modulation Index ($\Delta F2$ Avg./ $\Delta F1$ Avg.)	0.8	-	-	
Modulation Characteristics Stable Modulation (LE1M)	$\Delta F1$ Avg.	247.5	-	252.5	kHz
	$\Delta F2$ Max.	185	-	-	kHz
	Modulation Index ($\Delta F2$ Avg./ $\Delta F1$ Avg.)	0.8	-	-	
Modulation Characteristics Stable Modulation (LE2M)	$\Delta F1$ Avg.	495	-	505	kHz
	$\Delta F2$ Max.	370	-	-	kHz
	Modulation Index ($\Delta F2$ Avg./ $\Delta F1$ Avg.)	0.8	-	-	

4.2.2 Bluetooth LE RF Receiver Specification

Table 9. Bluetooth LE Receiver Performance Specification

Parameter	Condition	Min.	Typ.	Max.	Unit
Frequency Range	-	2402	-	2480	MHz
Rx Sensitivity @30.8% PER	LE1M	-	-99	-	dBm
	LE2M	-	-95	-	

5 Module Electrical Characteristics

5.1 Module Operating Conditions

Table 10. Module Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Units
VCC	Power supply voltage	3.0	3.3	3.6	V
Ta	Ambient operating temperature	-40	-	105	°C
Ts	Storage temperature	-40	-	125	°C

5.2 Module DC Characteristics

Table 11. DC Characteristic (3.3V, 25°C)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VIH	Input-High Voltage	LVTTL	2.0	-	-	V
VIL	Input-Low Voltage	LVTTL	-	-	0.8	V
VOH	Output-High Voltage	LVTTL	2.4	-	-	V
VOL	Output-Low Voltage	LVTTL	-	-	0.4	V
VT+	Schmitt-trigger High Level	-	1.78	1.87	1.97	V
VT-	Schmitt-trigger Low Level	-	1.36	1.45	1.56	V
IIL	Input-Leakage Current	VIN=3.3V or 0	-10	±1	10	μA

Figure 1: Dimensions of the proposed antenna. The figure consists of three views: Top view, Side view, and Bottom view. The Top view shows a rectangular antenna with a central square loop (13.8±0.2 mm by 15.8±0.2 mm) and a meander line structure. Dimensions include 16±0.2 mm for the top width, 24±0.2 mm for the total height, 14 mm for the bottom width, 6 mm for the top meander line height, 7 mm for the bottom meander line height, 2 mm for the top meander line width, 1 mm for the bottom meander line width, 10 mm for the bottom width of the central loop, 2 mm for the bottom width of the central loop, 3 mm for the bottom width of the central loop, and R0.25 for the bottom loop radius. The Side view shows a 0.8 mm thick substrate and a 7 mm high antenna structure. The Bottom view shows the antenna structure from below, with dimensions 1 mm for the bottom width, 2 mm for the bottom width, 3 mm for the bottom width, and 1 mm for the bottom width. The unit is mm.

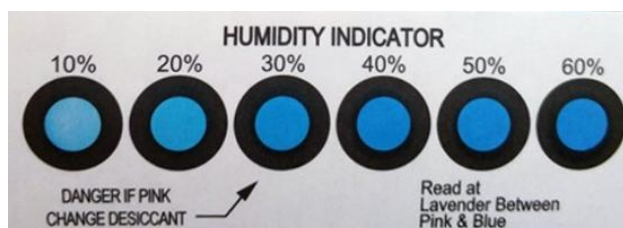
Datasheet

8 Product Handling

8.1 Storage Conditions

The storage conditions for a delivered module:

- Moisture sensitive level (MSL): 3
- Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
- Peak package body temperature: 260°C
- A humidity indicator card (HIC) in the packaging bag.



- After bag is opened, the module that will be subjected to reflow solder or other high temperature process must be
 - Mounted within: 168 hours of factory conditions ≤30°C/60% RH, or
 - Stored per J-STD-033
- The module needs to be baked in the following cases:
 - The packaging bag is damaged before unpacking.
 - There is no humidity indicator card (HIC) in the packaging bag.
 - After unpacking, circles of 10% and above on the HIC become pink.
 - The total exposure time has lasted for over 168 hours since unpacking.
 - More than 12 months have passed since the sealing of the bag.
- If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure.

i NOTE

Level and body temperature are defined by IPC/JEDEC J-STD-020.

8.2 Production Instructions

- The PKM8720F-C13-F10 module can be packaged with the SMT process according to the customer's PCB designed to be SMT-packaged. After being unpacked, the module must be soldered within 24 hours. Otherwise, it needs to be put into the drying cupboard where the relative humidity is not greater than 10%; or it needs to be packaged again under vacuum and the exposure time needs to be recorded (the total exposure time cannot exceed 168 hours).
 - SMT devices needed:
 - ◆ Mounter
 - ◆ SPI
 - ◆ Reflow soldering machine
 - ◆ Thermal profiler
 - ◆ Automated optical inspection (AOI) equipment
 - Baking devices needed:
 - ◆ Cabinet oven
 - ◆ Anti-electrostatic and heat-resistant trays
 - ◆ Anti-electrostatic and heat-resistant gloves
- Baking settings:
 - Temperature: 40°C and ≤ 5% RH for reel package and 125°C and ≤5% RH for tray package (use the heat-resistant tray rather than a plastic container)
 - Time: 168 hours for reel package and 12 hours for tray package
 - Alarm temperature: 50°C for reel package and 135°C for tray package
 - Production-ready temperature after natural cooling: < 36°C
 - Re-baking situation: If a module remains unused for over 168 hours after being baked, it needs to be baked again.
 - If a batch of modules is not baked within 168 hours, do not use the wave soldering to solder them. Because these modules are Level-3 moisture-sensitive devices, they are very likely to get damp when exposed beyond the allowable time. In this case, if they are soldered at high temperatures, it may result in device failure or poor soldering.
- In the whole production process, take electrostatic discharge (ESD) protective measures.

- To guarantee the passing rate, it is recommended to use the SPI and AOI to monitor the quality of solder paste printing and mounting.

8.3 Recommended Oven Temperature Curve

There are some differences between the set temperatures and the actual temperatures. All the temperatures listed in this datasheet are obtained through actual measurements.

For the SMT process, set oven temperatures according to Figure 6.

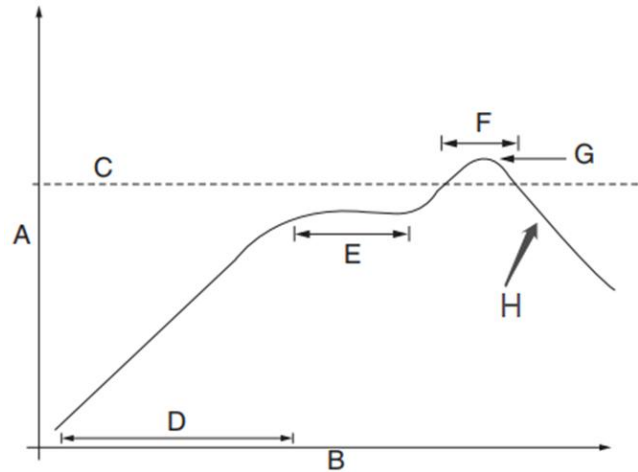


Figure 6. Reflow Soldering Curve Diagram

- D: Rising speed = $(1 \sim 3)^{\circ}\text{C/s}$, $20^{\circ}\text{C} \sim 150^{\circ}\text{C}$, 60s \sim 90s
- E: Average preheating temperature = $150^{\circ}\text{C} \sim 200^{\circ}\text{C}$, 60s \sim 120s
- F: Temperature fluctuation $> 217^{\circ}\text{C}$, 50s to 70s; peak temperature = $235^{\circ}\text{C} \sim 245^{\circ}\text{C}$
- H: Drop speed = $(1 \sim 4)^{\circ}\text{C/s}$

i NOTE

Adjust the balance time to ensure the rationalization treatment of gas when tin paste solves. If there are too much gaps on the PCB board, increase the balance time. Considering that the product is long placed in the welding area, to prevent components and bottom plate from damage.

9 Revision History

Data	Revision	Change Note
2023-03-30	1.0	Initial release